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Man-made changes of the relief due to the mining activities within Husnicioara open pit (Mehedinţi County, Romania)

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Abstract

Depending on the relief, the technological process for lignite extraction from Husnicioara open pit uses 2 or 3 excavation steps of the mine waste deposits that lie over the coal strata (I+IV); first, the mining waste is deposited in the outer spoil tip and then in the inner tip, followed by coal excavation on another step. So far, the mining activities have affected 3.5 sqkm, including part of the Lungă and Lacului Valleys, and Faţa Lacului and Pădurea Dumbrava hills. The area of the mining exploitation is an artificial space that functions according to new rules. Consequently, the study attempts to identify the man-made changes of the relief due to the mining activities using field measurements, Landsat satellite images and NDVI index. The results reveal that the lignite exploitation implies the dislocation, relocation and storage of materials, which has caused a significant change of the local geomorphological context, leading to the construction of some anthropic structures such as cavities and prominent relief forms.

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Keywords: Open pit; Geomorphological system; Landscape changes; Husnicioara

1. Introduction

Mining exploitation areas are artificialized spaces that function on the basis rules imposed by the anthropic-natural interaction. Anthropogenic changes vary in time [1] and space that is why it is difficult to establish the

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intensity with which they have occurred. The human impact on the relief has been widely described in the last years [2, 3, 4, 5] putting the right emphasis on environmental aspects of relief transformation [6].

Investigations of heavy metal pollution and seasonal changes in soil properties due to coal mine impacts were achieved in the current European researches [7, 8]. Thus, international regulations should be transposed into Romanian policy regarding environmental liabilities and the field of Environmental Justice, which would conduct to identifying and attaching a plurality of values to environmental damages [9]. More than that, many studies on land-cover explorations by processing of satellite images are becoming increasingly important tools for studying surface man-made activities on local and regional scales, e.g. determination of vegetation change using thematic mapper imagery [10]. Processing of 3D models and interactive visualization options represent important factors for the landscape modeling of areas affected by mining [11].

Mining areas in Romania present common negative aspects such as: anthropogenic disorganization of the network, partial modification or destruction of the aquifer layers, aggression of the biotic and pedologic domain, triggering or accelerating contemporary geomorphological processes [12, 13], aggression of the inhabited spaces and damages to population's health [14].

The research of the Lower Pliocene deposits from Husnicioara open pit began in 1989 [15] and have been continued till now. In 2000 Fodor et al. [16] analyzes the Romanian open pit lignite mining impact on soil. Contributions concerning the Dacian flora in southwesten Oltenia were brought by Diaconu et al [17] through analyzing the paleofloristic material collected from the roof of the IV-th coal layer.

This study aims to identify and value the man-made changes of the relief and environment at different stages of the Huşnicioara open pit life cycle. In order to identify the relief changes at spatial and temporal scale, on the one hand we intend to compare the initial relief with the actual one, based on cartographic documents and field measurements, and on the other hand we aim to analyze the impact of mining activities on vegetation with the help of Landsat satellite images and the interpretation of the NDVI index values.

Study area

Husnicioara open pit lies in the central part of the Mehedinţi county, 15 km from the county seat (Drobeta Turnu-Severin). The exploitation area is located between Negreşti settlement, in the north, Dumbrăviţa and Oprăneşti in the east, Gârdan Hill in the south and the cuesta that separates the Severin Depression from Coşuştea Hills in the West (Fig.1).

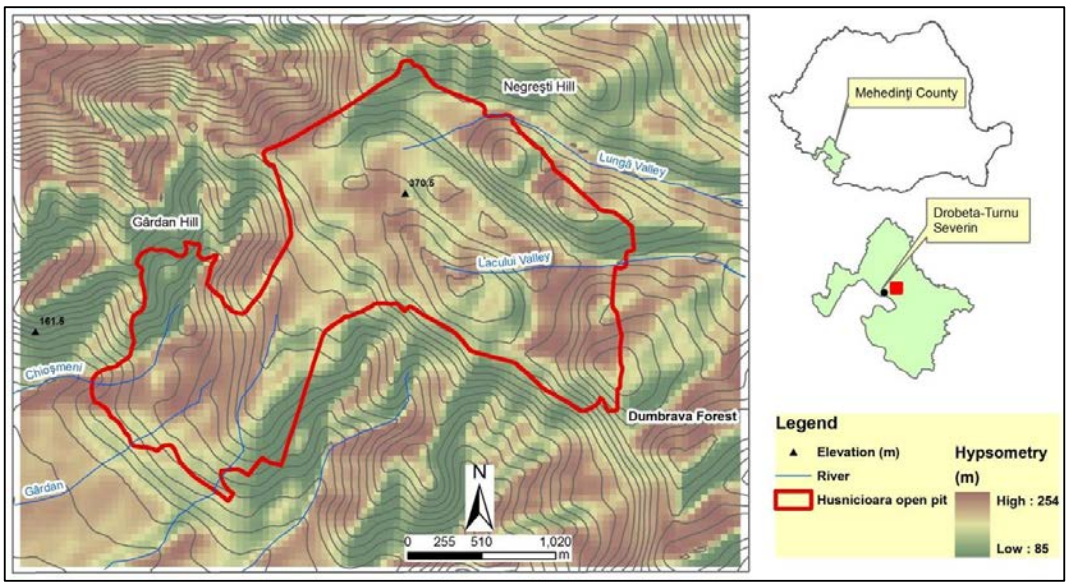

Fig. 1. Husnicioara open pit - national and regional location